Quantitative Comparison of FUDR Release Proposal Vs. Interim Fisheries Protection Program

DRBC Operations Branch
November 2004

The interim fishery releases program for the three New York City Delaware Basin reservoirs was approved by DRBC Docket D-77-20 CP (Revision 7) on April 21, 2004. The program established minimum flow targets for the East and West Branches of the Delaware River and the Neversink River. It also increased the volume of storage allocated to fishery releases during the interim period of three years. The Friends of the Upper Delaware River (FUDR) has objected to the interim releases program in the upper Delaware River. The FUDR's concern is that the volume of storage allocated for fishery releases, the West Branch Delaware River flow target at Hale Eddy, and the minimum release from Cannonsville Reservoir are inadequate for maintaining coldwater temperature conditions for wild trout in the West Branch and upper main stem of the Delaware.

The FUDR has proposed an alternative program for the West Branch Delaware River only. The program would set two minimum release levels from Cannonsville Reservoir during normal operating conditions: 600 cubic feet per second (cfs) during the period May 15 to September 15, and 300 cfs during the remainder of the year.

The DRBC Operations Branch staff analyzed historical data and compared results of daily flow model runs. Controlled releases and spill data for Cannonsville Reservoir were obtained from the reports of the Delaware River Master and from the New York City Department of Environmental Protection (NYCDEP) for the period 1978 to 2004. In addition, a daily flow model run using the DRBC OASIS model was made by the DRBC staff to compare the FUDR proposal and the Interim Fisheries Protection Program in terms of releases, diversions, storage, and drought operation frequency. Summaries of the historical information and the modeling comparison are provided below.

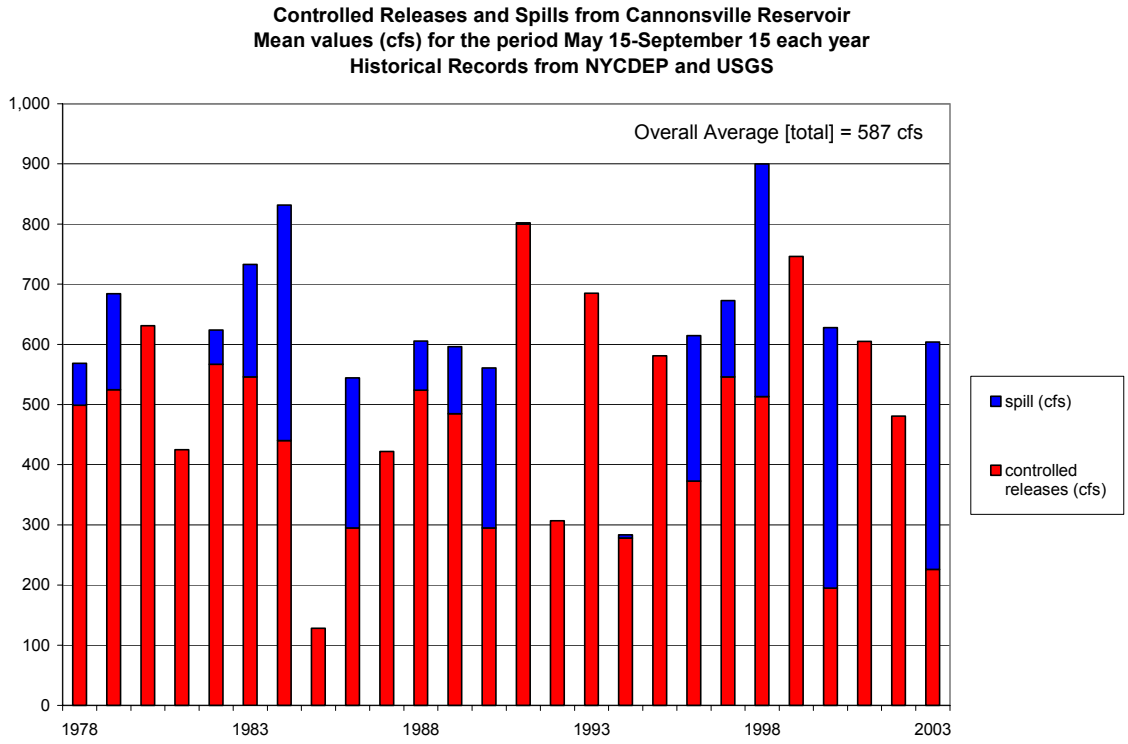
Historical Releases from Cannonsville Reservoir

Figure 1 shows the mean controlled releases and spills from Cannonsville Reservoir for the period of May 15 to September 15 for the calendar years 1978 to 2003. For the 26-year period, the overall average controlled release during the May 15 to September 15 period was 460 cfs. The average varied from a low of 128 cfs in 1985 to a maximum of 800 cfs in 1991.

The major factor affecting the mean controlled release values from Cannonsville Reservoir is the amount of directed release required to meet the Montague flow target at Montague, N.J. This amount can vary greatly from year to year. For example, hydrologic conditions in the years 2000 and 2003 were above normal and therefore required a lower-than-normal volume of controlled releases to meet the Montague target flow (see Figure 1). Another factor affecting the mean release values shown in Figure 1 was the lowering of the minimum Cannonsville release during normal operations from 325 cfs (from June 15 to August 15) to 160 cfs (from June 1 to Sept 15) in early 1997. A third factor is the reduced releases during periods of drought operation when the Montague target drops from 1,750 cfs (normal operations) to as low as 1,100 cfs and conservation

releases are cut back. An extreme example is the year 1985, which stands out due to the extremely low releases that were made. This was caused by drought operating conditions (based on NYC storage) combined with above-normal summer rainfall in such a way that the Montague flow target was met while maintaining minimum drought level releases during the entire summer season.

Figure 1



The data show that historical controlled releases from Cannonsville Reservoir for the May 15 to September 15 period has *averaged* 460 cfs for the 26 years from 1978 to 2003. This is 140 cfs less than the *minimum* release of 600 cfs proposed by FUDR for the May 15 to September 15 period. Modeling of the Interim Fisheries Protection Program by the DRBC staff for the 1928 to 1986 period indicates a 415 cfs average release for the May 15 to September 15 period.

When spills are added to controlled releases, the total flow out of Cannonsville Reservoir displayed in Figure 1 for the May 15 to September 15 period has *averaged* 587 cfs for the 26 years from 1978 to 2003. This figure is still lower than the *minimum* release of 600 cfs proposed by FUDR during the May 15 to September 15 period under normal operating conditions.

Comparison of FUDR Proposal vs. Interim Fisheries Protection Program

A daily flow model analysis was performed by the DRBC staff to compare the FUDR proposal and the recently adopted Interim Fisheries Protection Program. It was assumed that the FUDR proposed release would be lowered during phases of drought operation by the same percentage as the New York City Diversion. A comparison of the minimum releases used to model the two plans is given in Table 1.

Table 1: Minimum Releases* (cfs)

Operating Status		Period	Release (cfs)	Period	Release (cfs)
FUDR:	Normal Operations	5/15-9/15	600 cfs	9/16-5/14	300 cfs
	Drought Watch		510 cfs		255 cfs
	Drought Warning		420 cfs		210 cfs
	Drought		390 cfs		195 cfs
Interim Program:	Normal Operations	6/1-8/31	60 cfs	9/1-5/31	45 cfs
	Drought Watch		51 cfs		38 cfs
	Drought Warning		43 cfs		32 cfs
	Drought		23 cfs		23 cfs

* Due to concern over the adequacy of the minimum releases at the dams, and based on operating experience during this past summer, alternate minimum releases are under consideration.

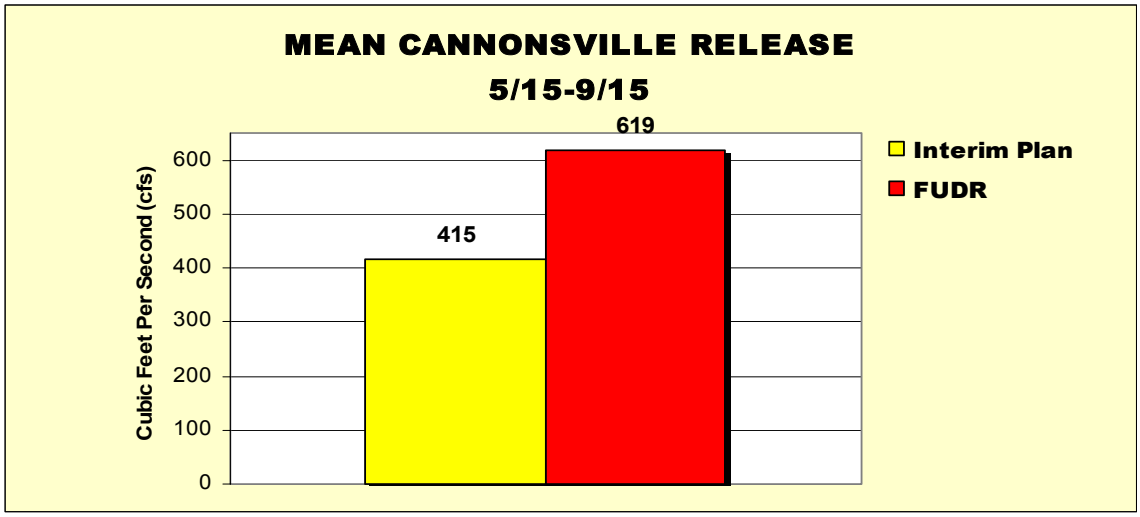
Under the Interim Program, minimum releases are controlled by several factors. First, releases are made to maintain a minimum flow target of 225 cfs on the West Branch of the Delaware River at Hale Eddy during normal operations. Second, thermal releases are made when necessary and may exceed the flow target release requirements. Third, releases are also made when necessary to meet the Montague, N.J. flow target. Model results for the Interim Program show the average Cannonsville release under all conditions averages approximately 415 cfs during the May 15 to September 15 period, but reaches the minimum levels listed in Table 1 during drought operations.

For both the FUDR and Interim Program model runs, the release rules for Pepacton and Neversink reservoirs were assumed to be the same and follow the rules of the Interim Program.

Modeling Results for 59-Year Modeling Period (1928-1986)

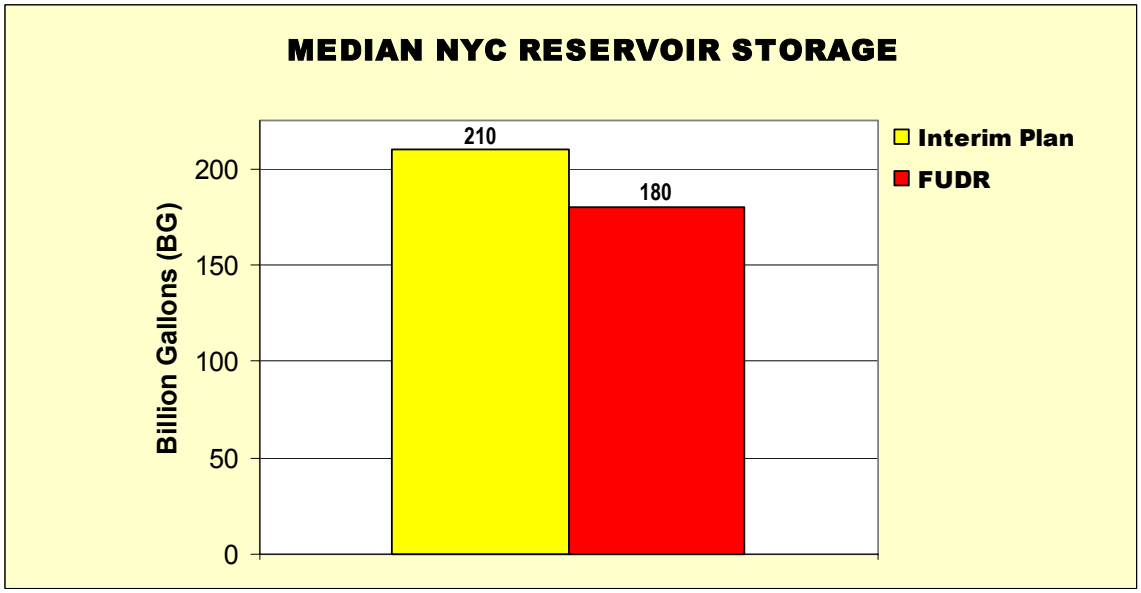
Figure 2 shows a comparison of the computed mean controlled release from Cannonsville Reservoir for the Interim Program and the FUDR proposal. The mean release of 619 cfs under the FUDR proposal is approximately fifty percent more than the mean release of 415 cfs which results from modeling the Interim Program.

Figure 2



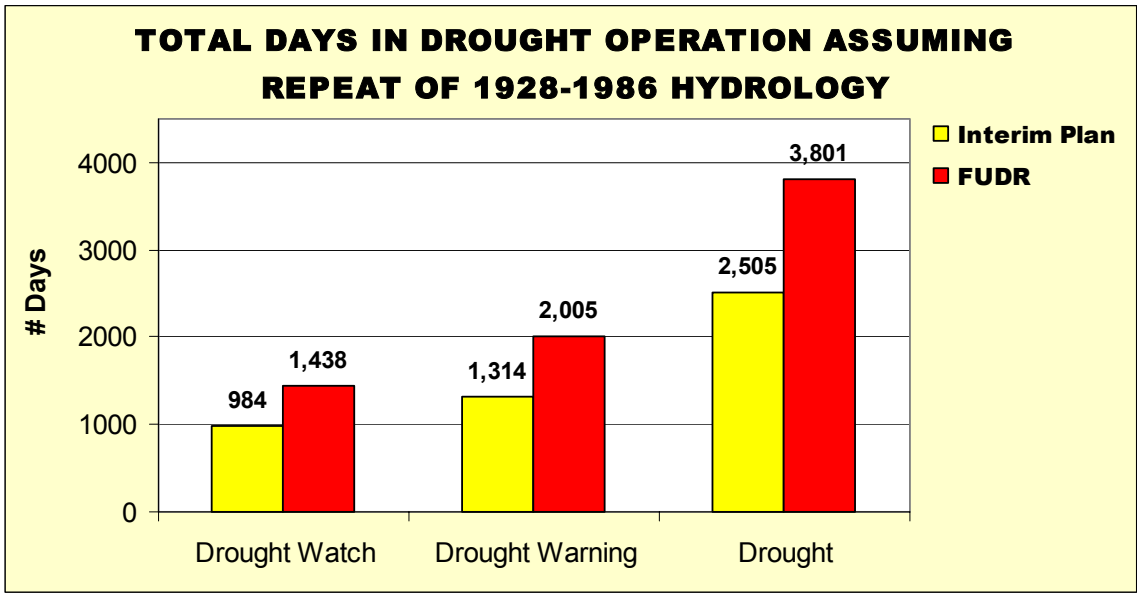
The increased releases under the FUDR proposal require additional use of storage in the NYC Delaware Basin reservoirs. Figure 3 shows that the median storage in the NYC Delaware Basin reservoirs for the 1928 to 1986 modeling period is approximately 30 billion gallons less for the FUDR proposal than for the Interim Program.

Figure 3



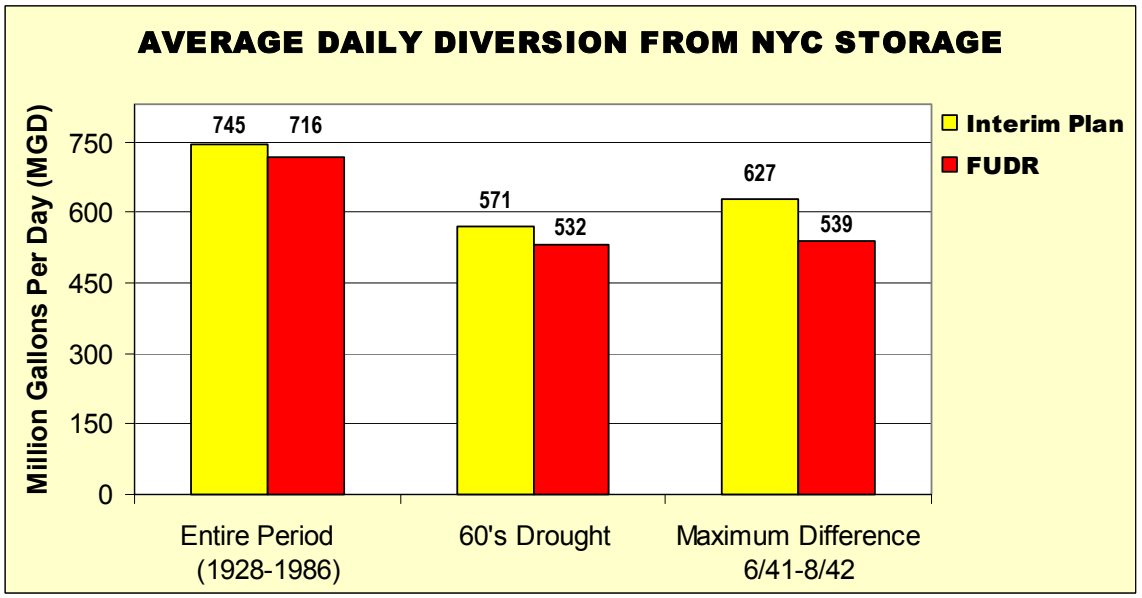
Modeling shows that the reduced storage under the FUDR proposal leads to an increase in the number of days in drought watch, drought warning, and drought operations in comparison to the Interim Program. Figure 4 shows that the time in each of these operating stages would increase by approximately 50 percent.

Figure 4



The increased time in the three stages of drought operation reduces the available diversion to New York City. The impacts on the downbasin states would include reduced diversions to the State of New Jersey and increases the amount of time that downstream flow targets on the main stem at Montague and Trenton, N.J. are reduced. Figure 5 shows that the average available diversion during the drought of the 1960s would be reduced by approximately 40 million gallons per day (mgd). The maximum reduction in average diversion capability shown by the modeling is in 1941/42 when the available diversion would drop by 88 mgd. These average diversion differences do not reflect the most critical conditions, which would occur under events like the 1960s drought. During such a drought, modeling shows the NYC reservoirs nearly empty under the Interim Program, both during the fall of 1964 and again in 1965. Under the FUDR plan, reservoir storage would reach such low levels sooner due to the increased releases that are proposed.

Figure 5



Conclusions

Modeling results show that the FUDR proposal would have significant impacts on the combined operations of the three NYC Delaware Basin reservoirs. In particular, increased drought frequency, reduced NYC reservoir storage, reduced diversions, and increased incidence of target flow reduction on the main stem Delaware are consequences that would face the basin states and the City of New York.